The Effects of Maternal Level of Education on Syntactic Development

A Senior Honors Thesis

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by

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Abstract

Over the years several studies have explored the effect of maternal level of education on lexical development in child language. However, the extent to which this factor influences children's syntactic development is more of an open question. This study examines whether maternal level of education correlates with children's receptive knowledge of tense marking and other grammatical constructions that theoretically depend on tense marking, such as subject pronominal case and subject auxiliary inversion. The sample is made up of 36 children between the ages of 3;4 and 6;6. The parents of the children completed a questionnaire that included questions about demographic information. Also, a standardized language test was administered to quantify the children's language skills. Then, a grammaticality choice task was used to test the children's knowledge of verb finiteness, pronoun case in subject position, subject auxiliary inversion in wh- questions, and binding. The results were then analyzed for significant correlations. The importance of this research is that it may help us to better understand the role of environmental factors in the development of children's syntax.

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Chapter 1: Introduction and Literature Review

Many studies have investigated the effect of maternal level of education on children's language development. Several of these studies are outlined in *Tense Over Time: The Longitudinal Course of Tense Acquisition in Children with Specific Language Impairment* (Rice, Wexler, & Hershberger 1998). Firstly, amount of talking by mothers to children correlates with maternal level of education (Hart & Risely 1995) and there is a strong correlation between the amount of talking a child is exposed to and the child's vocabulary size (Huttenlocher et al. 1991). For some researchers (e.g. Bates & Goodman 1997; Bassano 2000) the acquisition of vocabulary is equivalent to the acquisition of language. However, studies of tense acquisition in children showed that there was no significant correlation between maternal level of education and the development of tense (Rice, Wexler, & Hershberger 1998; Rice, Wexler & Redmond). In this chapter, I will describe the relevant findings from the studies from which the research question for this thesis was developed.

Section 1.0: The Relationship Between Maternal Level of Education and Children's Vocabulary Development

Hart and Risely (1995) conducted a longitudinal study in order to investigate the relationship between family interactions and children's rate of vocabulary growth. They observed 42 families, with varying socioeconomic statuses, from which they collected around 2½ years of data. The observers went to the homes of the families once a month, for hour-long sessions, and wrote down information about what the child did, who the child interacted with, and some of the dialogue that occurred between the children and various family members. They also audio-recorded children's interactions with parents, which were transcribed afterwards.

After analyzing their data, they discovered that the amount of talking the children were exposed to correlated most strongly with SES and that SES correlated highly with maternal level of education.

These findings of Hart and Risely (1995), when combined with the results of the study conducted by Huttenlocher et al. (1991), provide us with another piece of the language development puzzle. Huttenlocher et al. (1991) studied the effect of speech exposure on children's vocabulary development. The study consisted of two groups of eleven children, who were observed multiple times from 14-26 months of age during regular daily activities. The frequency with which the children were observed varied by group. Children from one group were observed every other month for five hours and children from the other group were seen every fourth month for three-hour increments. The sessions were audio-recorded and transcribed by the observer. It was shown that the relative frequency of different words that parents used when speaking with their children correlated with the order in which the children acquired those words. Furthermore, they found that there was a strong correlation between the amount of speech a child is exposed to and the rate of early vocabulary growth.

In sum, a mother's level of education predicts the amount she speaks to her child (Hart and Risely 1995) and the amount of talking done to a child correlates with vocabulary growth (Huttenlocher et al. 1991), but how does vocabulary development relate to language development?

Section 1.1: The Relationship Between Lexical Development and Language Development

For some researchers, the development of vocabulary is equivalent to the development of language. Bassano (2000) conducted a study on how noun and verb classes are acquired in French, as well as the interdependencies related to the development of these classes. The subject

of his research was a French child named Pauline (from 1;2-2;6). Her spontaneous speech was audio- and video-recorded twice a month during everyday activities. The audio was transcribed and the utterance/minute rate and MLU were calculated every month to monitor her language development. 120 utterances were chosen from each transcribed session to study. The verbs and nouns were analyzed based on their grammatical class, their morphological properties, and their lexical content. The semantic subclass of each noun or verb was also determined. The frequencies of nouns and verbs and their subclasses were calculated by type and token.

The results from this study indicated that nouns and verbs have different development patterns and "suggest that nouns clearly develop in lexical diversity from 1;2-2;6, while verbs tend to develop in both lexical diversity and in frequency of use" (535). His results show that noun and verb grammaticalization processes are gradual and that the construction of grammatical categories can be precisely tracked. Most importantly, his results suggest that the acquisition of grammar is related to lexical development, which supports the constructivist theory.

Bates and Goodman (1997) also studied the relationship between the lexicon and grammar. Their hypothesis was that grammar does not dissociate from the lexicon and that the two interact closely starting at an early age. First, they studied this relationship in children between 8 and 30 months of age. They looked at evidence from a longitudinal study of 27 children who were observed at various points from 10- 28 months of age, focusing on the relationship between vocabulary size and grammatical status, and found that the two had a strong correlation. They also used data gathered from parental reports and found that grammar and vocabulary had similar development patterns from 16-30 months of age. Additionally, they used evidence from a longitudinal study of Italian children, to show that the non-linear growth

function that links grammar and the lexicon is similar in at least two languages, English and Italian.

Next, they compared the results from the typically developing children with several atypical populations—early and late talkers, children with focal brain injury, Williams syndrome, and Down syndrome. The results from this part of the research were similar to the results of the typically developing children. Although development was delayed in many of these cases, it did not deviate from the standard pattern, showing that dissociation between grammar and the lexicon does not occur, even in atypical populations. The only exception they found was in children with Down Syndrome, in which significant dissociation between grammar and vocabulary development did occur. Bates and Goodman (1997) suggested that grammar and the lexicon are not two separate domains, but rather that natural language is acquired and processed by a "unified processing system" (510).

Section 1.2: Maternal Level of Education and Children's Knowledge of Tense Marking

It would seem to be a logical hypothesis, given the research outlined above, that maternal level of education would correlate with a children's grammatical development. However, the study of Rice, Wexler and Hershberger (1998) found that this was not the case for tense marking. They conducted a longitudinal study with the goals of identifying a clinical marker for SLI and bettering their understanding of grammatical acquisition (for children with and without SLI). In order to test their hypotheses, they used three groups of children including children with SLI, an age-matched control group, and a language matched control group. The children were tested seven times, once every 6 months. The test that they used was a measure of expressive grammar. Their data sample included both elicited and spontaneous utterances. The results of their study showed that the development of 4 tense markers (third person singular –s, past –ed, BE, and DO)

all correlated for children who were typically developing and children with SLI. Additionally, they found that several factors, including mother's level of education, nonverbal intelligence, vocabulary size, and MLU, were not predictors of the development of tense marking.

The study of Rice, Wexler and Redmond (1999) also found that maternal level of education did not correlate with a child's development of tense marking. Their study evaluated four models that have been proposed to explain the cause of grammatical limitations of children with SLI: Extended Optional Infinitive (Rice & Wexler 1996), Deficit in Subject-Verb Agreement (Clahsen, Bartke & Göllner 1997), Production Constraints (Bishop 1994), and Limited Input Processing Mechanisms (Leonard 1989). They used a receptive measure in order to investigate these various models. The participants were taken from the longitudinal study of Rice, Wexler and Hershberger (1998). They also had three groups (children with SLI, an age-matched group and an MLU-matched group). They found that MLU strongly predicted the growth of tense marking, but that maternal level of education, child nonverbal intelligence, and receptive vocabulary were not predictors of growth.

Section 1.3: The Correlation of Tense With Other Grammatical Constructions

We have seen thus far that the development of tense marking in children does not correlate with maternal level of education. Let us now consider the relationship between tense marking and two hypothetically tense-dependent constructions: subject pronominal case and subject-auxiliary inversion.

The Correlation of Tense with Pronominal Case

When developing language children use both nominative and non-nominative case pronominal subjects. When using finite verbs, they will often use nominative case (e.g. *He*

leaves) and when using a nonfinite verbs they will often use non-nominative case (e.g. *Him leave*). Loeb and Leonard (1991) examined the relationship between tense marking and case marking. Specifically, they wanted to determine whether the use of tense marking and case marking was more restricted in the language of children with SLI than in the language of their MLU-matched peers.

Their sample was made up of sixteen children between the ages of 2;11 and 5;0. Eight of the children were typically developing and eight had SLI. The children with SLI were older than the typically developing children by at least 12 months but both groups had comparable MLUs. For the study, Loeb and Leonard looked at the children's production of third person singular pronouns and the verb properties associated with third person singular subjects. They met with each child 8 times, for 60 minutes per session. Various tasks, such as play activities and storytelling tasks, were conducted and the children's utterances were recorded and transcribed. Loeb and Leonard found that the children with SLI produced more case errors than the typically developing children. They also found that correct usage of subject case was significantly correlated with correct use of verb finiteness in typically developing children ($r = .92$, $p < .01$) and in the children with SLI ($r = .74$, $p < .05$).

Following the insights of Loeb and Leonard, Schütze and Wexler (1996) proposed a more highly articulated theoretical model of the interaction between verb finiteness and subject pronominal case, known as the Agreement Tense Omission Model (ATOM), which assumes that the non-nominative case nature of pronominal subjects is driven by the nonfinite nature of the verbs in the sentences in which they occur. In their study, Schütze and Wexler argued that children know the case system of English from an early age and that their case errors have a highly systematic distribution. Data from other languages, show that non-English speaking

children make very few subject case errors. Schütze and Wexler theorized that this is because the default case varies depending on the language. For English the default case is accusative and for other languages, such as German or Spanish, the default case is nominative. While a nonfinite verb is likely to co-occur with an accusative case pronoun in child English, a nonfinite verb in child Spanish or German would be expected to occur with a pronoun in the default case, nominative, which is the same as the case expected in a finite sentence.

Schütze and Wexler used data from three children from the CHILDES Database (MacWhinney 2000). For each child, they counted the subject forms from the earliest non-nominative subject until the point at which the non-nominative subjects had disappeared. They made several generalizations after analyzing the data: non-nominative subjects almost never co-occur with finite inflection except occasionally with past tense, nominative subjects may, nonetheless, occur when inflection is absent, and non-nominative subjects can be accusative or genitive for the same child, at the same age in roughly equal proportions. Their findings are outlined in the following table.

Syntactic features	**Description**	**Morphological Expression**
a. [+tns, +agr]	NOM assigned	he cries
b.[+tns, -agr]	NOM unassignable, default ACC	he cries
c.[-tns, +agr]	NOM assigned, agreement invisible	he cry
d.[-tns, -agr]	NOM unassignable, GEN assigned	my cry, my crying

Table 1 – The Correspondence Between Syntactic Inflection Features and Morphology in Child English, According to the ATOM (Schütze and Wexler 1996, p 678)

They found that present and absent inflection is a syntactic contrast for children at the Optional Infinitive stage. Even though children make superficial errors, Schütze and Wexler provide evidence showing that young children understand many of their language's syntactic

mechanisms. Furthermore, these children knew that when the verb had inflection, the subject had to be nominative.

Following the work of Schütze and Wexler with spontaneous production data, Grinstead, Donnellan, Barajas, and Johnson (to appear) used receptive tasks to further examine the relationship between verb finiteness and the case of pronouns that occur in the subject position in child English. In earlier work, Rispoli (2005) showed that before children reach the 60% correct (adult-like) finiteness marking level, some of their non-nominative case errors are independent of finiteness and are more a function of children's lexical knowledge of the pronoun paradigm of English. In order to learn more about the relationship between case and finiteness, independent of the lexicon, Grinstead et al. tested children who fell above the 60% correct finiteness level, using two receptive tasks.

The first experiment tested verb finiteness judgments, specifically how often children judged verbs ending with past tense –ed or with auxiliary be as grammatical. The sentences presented to the children in this part of the test all had nominative case pronouns, in order to hold case constant. 52 children (3;6 – 5;9) passed the fillers on both experiments. In this task, it was shown that children's proficiency with past tense –ed was better than their proficiency with auxiliary be, though their judgments of these constructions correlated. Additionally, almost all of the children in the sample were above 60% correct in their finiteness judgments.

In the second experiment, they tested the children's grammaticality judgments of sentences with feminine and masculine third person singular pronominal subjects. In this task, verb finiteness was held constant. The same children from the first experiment were used in the second experiment. It was found that there was no significant effect of pronoun gender, consistent with Rispoli's (2005) claim of no pronoun asymmetries above 60% finiteness

marking. Most importantly, they found that the children's judgments from the first task (the Pronoun Case Task) correlated with their judgments from the second task (the Verb Finiteness Task). This shows that a link between judgments of finiteness and case exists that is not based on the lexicon. This experiment presents evidence that case and finiteness are linked in development supporting the idea that Case Theory exists in child language.

The Correlation of Tense with Subject-Auxiliary Inversion

Studies related to child syntax have shown that when children are developing their grammatical abilities they will produce the inverted adult-like forms (*What does Mommy like?*) as well as the non-adult-like uninverted forms (*What Mommy does like?)* of wh- questions (Rowland and Pine 2000). Past research has investigated whether or not subject-auxiliary inversion is related to verb finiteness. Proponents of Constructivist theory believe that there is no relationship between the two constructions (e.g. Freudenthal, Pine & Gobet 2009). On the other hand, the hypothesis that the two constructions are related is supported by Generativist theory (e.g. Rizzi 1996, den Besten 1983). Generativist theory proposes that children optionally invert subjects and verbs at the same time as they optionally mark finiteness on verbs and they take the two phenomena to be related. Similar observations have been found in other development studies which show that children use the "optional inversion" rule when they produce questions, which is why they may or may not use a correctly inverted question during the same period in language development (Valian, Lasser & Mandelbaum 1992).

The studies of Ricci (2009) and Grinstead, Warren, Ricci, and Sanderson (2009) examined the link between the development of verb finiteness and subject-auxiliary inversion in typically developing preschool children. The participants included 106 children, who were monolingual English speakers, between the ages of 3;1 and 5;11. However, only 45 children

passed filler items on both the finiteness and subject-inversion test, so the data is drawn from this group. Additionally, data from 18 other participants, who were tested by Warren in 2007, were added to the sampling. Combined, these 63 children had a mean age of 4;10.

The two tests that were used for this study were the Nonfinite Verb Grammaticality Choice Task and the Subject-Auxiliary Inversion Grammaticality Choice Task. The procedure for both the finiteness task and the subject-auxiliary inversion task were virtually the same, varying only by the test questions and the images presented.

For the finiteness task, an 83% correctness rate was found across all subjects. Also, all finiteness variables correlated with one another except auxiliary *be* and -ed. For the subject-auxiliary inversion task, participants recognized the appropriate use of *do* the most consistently, struggled the most with modals, and scored in the mid-range for copular and auxiliary *be*. Overall, it was found that judgments of finiteness and subject-auxiliary inversion were significantly correlated ($r=.525$, $p<.001$, $n=63$), thereby showing that finiteness and inversion are related across development. These findings support the generative grammar hypothesis, which states that finiteness is necessary for inversion.

Chapter 2: Summary and Research Question

It has been found that maternal level of education affects the frequency with which a mother speaks to her child (Hart and Risely 1995) and that the amount of talking a child is exposed to affects his or her vocabulary size (Huttenlocher et al. 1991). Additionally, certain researchers believe that the acquisition of vocabulary is equivalent to the acquisition of language (e.g. Bates and Goodman 1997; Bassano 2000). Based on the information from these studies it would be logical to hypothesize that maternal level of education predicts children's acquisition of grammar. However, in studies thus far (e.g. Rice, Wexler, and Hershberger 1998; Rice, Wexler, and Redmond 1999) this has not proven to be the case, at least not with respect to children's knowledge of tense. Both of these studies found that the development of tense did not correlate with maternal level of education.

Using current research as a foundation, this project investigates whether maternal level of education predicts children's knowledge of tense marking, as well as their knowledge of constructions that theoretically depend on tense marking, such as subject pronominal case and subject-auxiliary inversion. It seems plausible that these constructions, which have a more substantial lexical component than tense marking, might be predicted by variables that are sensitive to lexical development like maternal level of education.

Chapter 3: Methods

Section 3.0: Participants

40 children were tested for this study, but 4 were excluded for not passing all of the filler items. The sample was made up of thirty-six typically-developing, monolingual English-speaking children. They were all speakers of Mainstream American English. There were 21 girls and 15 boys. The mean age was 55 months (4 years, 7 months).

	N	Minimum	Maximum	Mean	Std. Deviation
Age in Months	36	40	66	55.44	6.336

Table 2 – Descriptive Characteristics of Sample

Section 3.1: Procedures

First, a questionnaire was filled out by the parents to gather demographic information. Then, the Clinical Evaluation of Language Fundamentals, Preschool, 2nd Edition (CELF-P2) was administered to each child. Additionally, each child took part in a Grammaticality Choice test (Pratt & Grinstead 2007) that measured their knowledge of several syntactic constructions.

Questionnaire

The parents or guardians of the children were asked to fill out a questionnaire that included information about socioeconomic status, maternal level of education, and the languages spoken in the home (see Appendix B). This enabled us to compare the results of the test with the child's background in order to examine any possible correlations between maternal level of education and the child's development of the various grammatical constructions.

CELF-P2

In order to determine the children's language level, obtain a receptive lexical measure, and screen for any language disorders, the standardized test CELF-P2 (Clinical Evaluation of Language Fundamentals, Preschool, 2nd Edition) was used. We used three subtests of the CELF-P2 that make up the Core Language Score: Sentence Structure, Word Structure, and Expressive Vocabulary.

Grammaticality Choice Test

This Grammaticality Choice Test format (Pratt & Grinstead 2007) was used to measure the children's knowledge of tense marking, pronominal case in subject position, subject-auxiliary inversion, and knowledge of Principle A of the Binding Theory (see Appendix A). The general procedure to test these various grammatical forms differs only by the type of question that is presented to the child.

For this test, children were introduced to two puppets, in this case an eagle and a raccoon. They were told that the puppets were babies who were just learning how to talk. There was also a book of images in front of them. It was explained that each puppet was going to say a sentence about the pictures. The child was instructed to pick the puppet that said the sentence the best and it was emphasized that either puppet could be right or wrong.

There were six practice questions to familiarize the child with the format and procedure of the test. During the practice questions, the child was corrected if he or she answered the question incorrectly. Also, within the test, there were eight filler questions. The filler questions were grammatical forms that the children should have already acquired, like *plural –s* and

present progressive –ing. Four of the filler questions from the test are shown on the following page.

**The girl is swim.*
The girl is swimming.

The girl is picking flowers.
**The girl is pick flowers.*

**The dog plays with block.*
The dog plays with blocks.

**The cat has two ball.*
The cat has two balls.

These fillers were used to determine if the child understood the task and to eliminate those who were just guessing. Only children who passed all filler judgments were included in the sample.

The items to test verb finiteness were modeled after the Tense test used in Donnellan 2010. We used *past tense –ed* and *auxiliary be* to test for the children's knowledge of verb finiteness. Sample items from this part of the test are shown below:

Past tense –ed
**He color a picture.*
He colored a picture.

Auxiliary be
She is dreaming.
**She dreaming.*

The items used to test knowledge of subject-auxiliary inversion were derived from the Subject-auxiliary test found in Ricci 2009. The wh- elements that these items included were *what, where, when,* and *why*. Also, the finiteness markers used for this section were limited to *copula be* and *do support*. Samples of this type of question are shown below:

What does the girl play?
**What the girl does play?*

**Why the puppy is scared?*
Why is the puppy scared?

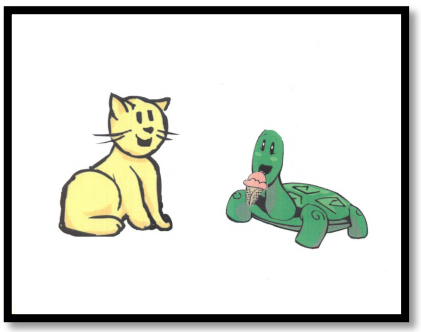
The items that tested pronoun case were also based on those used by Donnellan (2010). These questions included third person singular masculine and feminine pronouns only (i.e. she/him but not I/we/them). The verbs used in these types of questions were always finite and were either *third person singular s* or *copular be*. The following are examples of this item type:

**Him watches the ball.*
He watches the ball.

She is a turtle.
**Her is a turtle.*

Items testing children's know of Principle A of the Binding Theory (Chomsky 1981) were also included in the test, because children's knowledge of Principle A is known to develop gradually (Chien & Wexler 1990) and because this knowledge is not thought to be related to knowledge of tense. Consequently, children's responses to these items were not predicted to correlate with their responses to those measuring pronominal case, verb finiteness or subject-auxiliary inversion. They were included to refute the potential counterargument to the effect that all aspects of children's grammatical development correlate. The questions used to test binding were based on the items used by Heath (2011) and Hall (2011). A sample of a binding item and the related image is shown below:

**The cat thinks that the turtle is feeding him.*
The cat thinks that the turtle is feeding himself.



Chapter 4: Results

Questionnaire

To gather information regarding family income, maternal level of education, etc., we used a family questionnaire. The critical demographic variable for my study is maternal level of education.

Mother's Level of Education	Frequency	Percent
High school diploma or equivalent, plus technical training/certificate	1	2.9
Some college but no degree	1	2.9
A.A./A.S./two-year degree	2	5.7
Bachelor's Degree	11	31.4
At least one year of course work beyond a B.A. or B.S.	1	2.9
Education specialist or professional diploma beyond Master's	14	40.0
Doctoral Degree	5	14.3
Total	35	100.0

Table 3– Distribution of Maternal Level of Education in the Sample

As we can see in this table, there are a variety of educational levels represented in the sample, although it is skewed towards higher education levels. Though our sample consists of 36 children, the family of one child did not provide an answer to the question regarding maternal level of education. His data will be left in the sample for measures that do not relate to maternal level of education but will be automatically removed by SPSS in the correlation tests.

CELF-P2

To ensure that the children participating in the study were typically-developing, only children with CELF-P2 standard scores above 85 were included in our sample. In the following table, we see that the 36 children in our sample have a mean CELF-P2 score of 116.28 and a range of 86 to 137, with a standard deviation of 10.687.

	N	Minimum	Maximum	Mean	Std. Deviation
CELF Standard	36	86	137	116.28	10.687

Table 4 – CELF-P2 Standard Scores of Children in the Sample

Verb Finiteness

For the Grammaticality Choice measures, we measured children's acceptance of finite vs. nonfinite verb forms with *regular past tense –ed* marking and *auxiliary be* forms. There were four of each item type. Children's mean scores are given in the following table.

	N	Minimum	Maximum	Mean	Std. Deviation
VF Aux	36	2	4	3.67	.632
VF -ed	36	2	4	3.36	.762
VF (total)	36	5	8	7.03	1.082

Table 5 – Children's Scores on the Verb Finiteness Items of the Test

Children's verb finiteness scores for *auxiliary be* and *regular past tense -ed* were significantly different from each other, with *auxiliary be* having a higher mean score (by Wilcoxon signed-rank test, $Z = -2.011$, $p = .044$).

Pronoun Case

The second of our subscores measures children's judgments of sentences with both nominative and non-nominative case pronouns. They occurred with both *3rd person singular –s* and *copula be*. The scores are given in the following table.

	N	Minimum	Maximum	Mean	Std. Deviation
Pronoun Case Cop	36	1	4	3.69	.710
Pronoun Case 3S	36	1	4	3.81	.577
Pronoun Case (total)	36	3	8	7.50	1.134

Table 6 – Children's Scores on the Pronoun Case Test

On the Pronoun Case test, children did not score significantly better on either of the two finiteness types ($p > .05$) and the two scores correlated (by Kendall's Tau-B, $r = .436$, $p = .007$).

Subject-Auxiliary Inversion

The third of our subscores measures children's judgments of wh- questions that were inverted (e.g. What did Mommy eat) and uninverted (What Mommy did eat?). These questions used either *what, where, when,* and *why* question words and varied by whether they occurred with *copula be* or *auxiliary be*. The results are presented in the following table.

	N	Minimum	Maximum	Mean	Std. Deviation
Subject-Aux Cop	36	1	4	3.42	.806
Subject-Aux Do	36	0	4	3.36	.867
Subject-Aux (Total)	36	1	8	6.78	1.476

Table 7 – Children's Scores On the Subject-Auxiliary Inversion Test

Children were not significantly better at judging questions with *copula be* than they were at judging sentences with *auxiliary be* ($p > .05$). Children's scores on both inflectional subtypes correlated (by Kendall's Tau-B, $r = .422$, $p = .007$).

Binding

In this part of the test, children's abilities to judge pictures as accurate representations of reflexive actions, with reflexive pronouns vs. non-reflexive pronouns, were measured. The results are presented in the following table.

	N	Minimum	Maximum	Mean	Std. Deviation
Binding	36	1	8	5.47	2.274

Table 8 – Results of the Binding Subtest

The results of the Binding subtest serve primarily to show that not all areas of child grammar develop in a correlated fashion. We see that the children's scores showed variability that would allow for correlation, if one existed.

Correlations Among Subscores

My fundamental question is whether maternal level of education and the verb finiteness-related constructions (pronoun case and subject-auxiliary inversion) are correlated during children's development of language. To test this question, a nonparametric correlation test, the Kendall's Tau-B, was computed over the following variables: Verb Finiteness, Pronoun Case, Subject-Auxiliary Inversion, Binding, and Maternal Level of Education.

Based on our sample, mother's level of education correlates with pronoun case, as we can see in the fifth row of the rightmost column of the following table, and with subject-auxiliary

inversion, as we see in the eighth row of the rightmost column of the following table, but not with verb finiteness, as we see in the second row of the rightmost column of the following table, nor with binding, as we see in the eleventh row of the rightmost column of the following table. These relationships are also represented in the scatterplot diagram in the following figure.

Although verb finiteness did not correlate with subject-auxiliary inversion in the study, past studies have shown that they do correlate (Ricci 2009). We were not able to replicate this correlation because we did not have as many item types testing subject-auxiliary inversion when compared to past studies.

		VF	**Pronoun Case**	**Subj-Aux**	**Binding**	**Mother's Education Level**
VF	Correlation Coefficient	1.000	.333*	.166	.137	.257
	Sig. (2-tailed)	.	.027	.247	.321	**.077**
Pronoun Case	Correlation Coefficient		1.000	.341*	.150	.327*
	Sig. (2-tailed)		.	.022	.295	**.031**
Subj-Aux	Correlation Coefficient			1.000	-.139	.293*
	Sig. (2-tailed)			.	.307	**.041**
Binding	Correlation Coefficient				1.000	.004
	Sig. (2-tailed)				.	**.976**
Mother's Education Level	Correlation Coefficient					1.000
	Sig. (2-tailed)					.

* Correlation is significant at the 0.05 level (2-tailed).

Table 9- Correlations Among Variables Using Kendall's tau-b (n=35 for Mother's Level of Education, n=36 for all others)

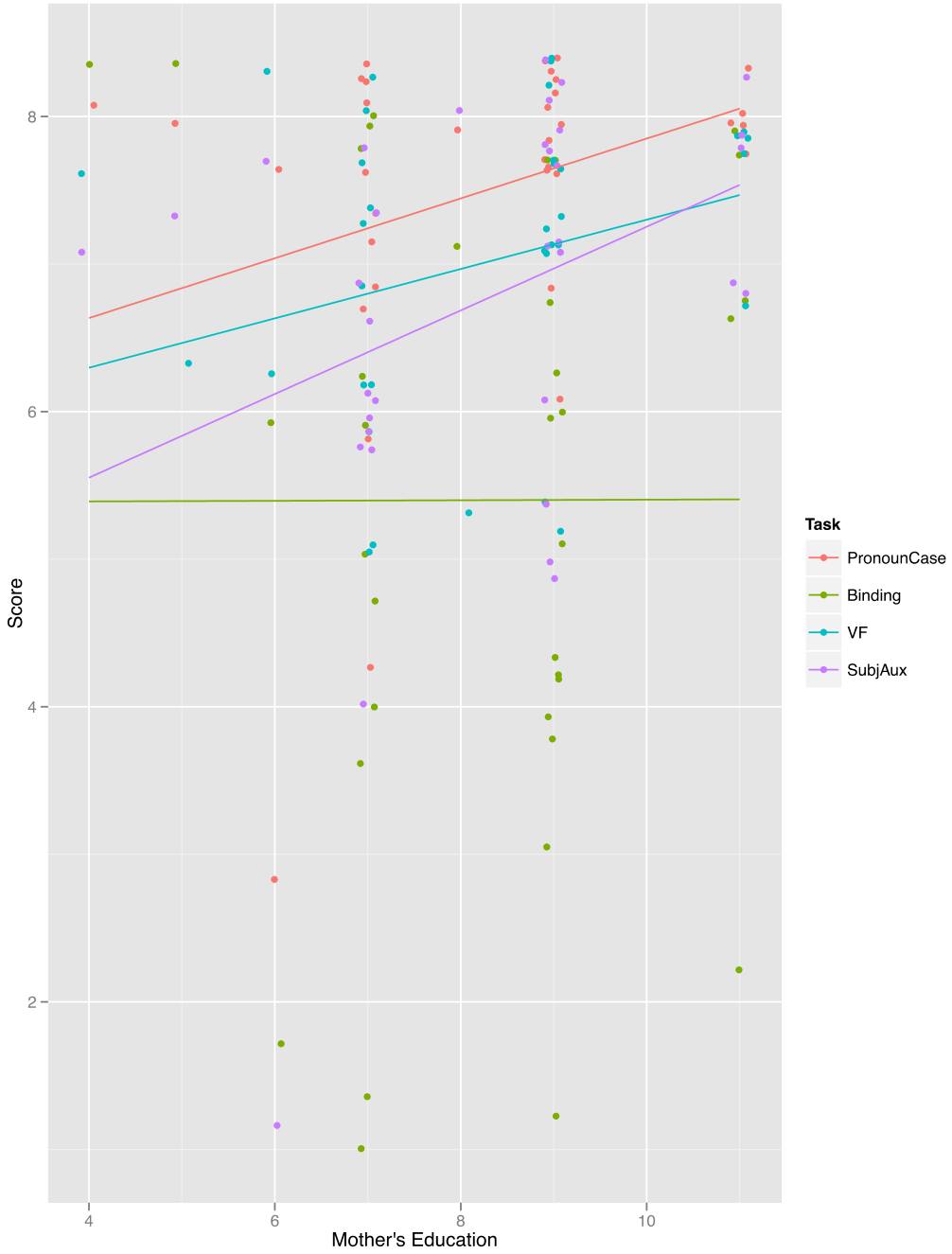


Figure 1 – Scatterplot Illustrating Relationship Between Maternal Level of Education (x axis) and Scores on the Grammaticality Measures (y axis)

Chapter 5: Discussion

Based on the sample it was found that mother's level of education did not correlate with tense marking, which is consistent with the findings of Rice, Wexler, and Hershberger (1998). This is meaningful because it is consistent with the hypothesis that this dimension of syntax is less dependent on child-directed input. Since mother's level of education did correlate with subject-auxiliary inversion and pronominal case, this suggests that these more complex, lexically-dependent constructions may have a substantial dependence on the same environmental factors that effect lexical development.

For these constructions, lexical knowledge is likely to be more important than it is for tense marking. Rispoli (2005), for example, has shown that children's knowledge of the English pronominal paradigm is slow to develop and that this delay is responsible for some of the non-nominative subject pronouns that occur in child English. Similarly, children's scores on the subject-auxiliary inversion test very likely reflect their knowledge of the array of wh- words (*what, where, when,* and *why)* we used to test subject-auxiliary inversion, as has been shown in other studies (e.g. Valian, Lasser & Mandelbaum 1992). Since it has been shown that mother's level of education correlates with lexical development, this could explain why maternal level of education correlates with subject-auxiliary inversion and pronominal case.

Further investigation is needed, across a wider range of maternal education levels, which would enable to us to better measure the effect it has on children's development of tense. Given the sensitivity of children with certain developmental language disorders, including specific language impairment, to constructions involving tense (Rice & Wexler 1996), a clearer understanding of the role of the interaction between tense and environmental variables such as

maternal level of education and SES could lead to improved diagnoses. Similarly, it would prevent environmental factors from confounding the diagnoses of these disorders.

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Appendix A: Test Items

			warm up	6	Binding	8
			Verb Finite Aux	4	*Verb finite-ed*	4
Date:			*Sub-Aux*	4	Pron Case-3S	4
Child:			sub-aux-copula	4	Filler	8
DOB:			Pron Case Copula	4		
Practice			Answer	No response		
C	1a. The cat wants two apples.				warm up	
I	1b. The cat wants two apple.					
C	2a. The girl is hugging the tiger.				warm up	
I	2b. The girl is hug the tiger.					
I	3a. The dog wants two carrot.				warm up	
C	3b. The dog wants two carrots.					
C	4a. The girl is feeding the dog.				warm up	
I	4b. The girl is feed the dog.					
I	5a. The boy is wash the animals.				warm up	
C	5b. The boy is washing the animals.					
C	6a. The dog sees two elephants.				warm up	
I	6b. The dog sees two elephant.					
			Answer	No response		
C	1a. He is holding the hat.				Verb Finite Aux #1	
I	1b. He holding the hat.					
I	2a. Where the crab does live?				*Sub-Aux #1*	
C	2b. Where does the crab live?					
C	3a. The cat has two balls.				Filler #8	
I	3b. The cat has two ball.					
I	4a. Why the puppy is scared?				sub-aux-cop #1	
C	4b. Why is the puppy scared?					
C	5a. He is a dog.				Case Copula #1	
I	5b. Him is a dog.					
I	6a. The cat is wear shorts.				Filler #1	
C	6b. The cat is wearing shorts.					
C	7a. The cat thinks that the dog is washing himself.				Binding #1	
I	7b. The cat thinks that the dog is washing him.					
I	8a. He dancing.				Verb Finite Aux #2	
C	8b. He is dancing.					
C	9a. The girl is picking flowers.				Filler #3	
I	9b. The girl is pick flowers.					
I	10a. Why the seal does balance the ball?				*Sub-Aux #2*	
C	10b. Why does the seal balance the ball?					
C	11a. The dog thinks that the cat is washing himself.				Binding #2	
I	11b. The dog thinks that the cat is washing him.					
C	12a. The turtle is eating.				Filler #6	
I	12b. The turtle is eat.					

I	13a. Where Daisy is?			sub-aux-cop #2
C	13b. Where is Daisy?			
I	14a. The cat thinks that the turtle is washing him.			Binding #3
C	14b. The cat thinks that the turtle is washing himself.			
C	15a. He is orange.			Case Copula #2
I	15b. Him is orange.			
C	16a. What does the girl play?			Sub-Aux #3
I	16b. What the girl does play?			
I	17a. The girl is swim.			Filler #2
C	17b. The girl is swimming.			
I	18a. He color a picture.			*Verb finite-ed #1*
C	18b. He colored a picture.			
C	19a. When does Garfield hug the bear?			Sub-Aux #4
I	19b. When Garfield does hug the bear?			
C	20a. What is the girl?			sub-aux-copula #3
I	20b. What the girl is?			
I	21a. Him watches the ball.			Pron-Case 3S #1
C	21b. He watches the ball.			
I	22a. The dog plays with block.			Filler #5
C	22b. The dog plays with blocks.			
C	23a. She is dreaming.			Verb Finite Aux #3
I	23b. She dreaming.			
C	24a. When is the girl happy?			sub-aux-cop #4
I	24b. When the girl is happy?			
I	25a. The turtle thinks that the cat is brushing him.			Binding #4
C	25b. The turtle thinks that the cat is brushing himself.			
C	26a.She watched a cat.			*Verb Finite-ed #2*
I	26b. She watch a cat.			
C	27a. Pooh is eating honey.			Filler #4
I	27b. Pooh is eat honey.			
I	28a. Her eats the food.			Pron-Case 3S #2
C	28b. She eats the food.			
I	29a. The dog thinks that the cat is feeding him.			Binding #5
C	29b. The dog thinks that the cat is feeding himself.			
C	30a. He holds a camera.			Pron Case-3S #3
I	30b. Him holds a camera.			
I	31a. The dog thinks that the turtle is brushing him.			Binding #6
C	31b. The dog thinks that the turtle is brushing himself.			
I	32a. The dog has two balloon.			Filler #7
C	32b. The dog has two balloons.			
C	33a. The cat thinks that the turtle is feeding himself.			Binding #7
I	33b. The cat thinks that the turtle is feeding him.			

I	34a. He paint a fence.			*Verb Finite -ed #3*
C	34b. He painted a fence.			
C	35a. She is a turtle.			Case Copula #3
I	35b. Her is a turtle.			
I	36a. The cat thinks that the dog is feeding him.			Binding #8
C	36b. The cat thinks that the dog is feeding himself.			
I	37a. She writing.			Verb Finite Aux #4
C	37b. She is writing.			
C	38a. She loves the puppy.			Pron Case-3S #4
I	38b. Her loves the puppy.			
C	39a. She opened her mouth.			*Verb Finite -ed #4*
I	39b. She open her mouth.			
I	40a. Him is a cat.			Case Copula #4
C	40b. He is a cat.			

Appendix B: Family Questionnaire

Child's Name_____

Name of Parent Answering Questionnaire_____

Date_____

1) You are the child's:
   - mom
   - dad
   - grandma
   - grandpa
   - aunt
   - uncle
   - guardian
   - other, please specify_____

2) Your child is a:
   - girl
   - boy

3) Is this your child's first year in preschool?
   - yes
   - no

4) What language do YOU speak at home?
   - English
   - Spanish
   - other, please specify_____

5) What language does your child speak at home?
   - English
   - Spanish
   - other, please specify_____

6) Who lives in your home? (Please circle all that apply)
   - child's mother
   - child's father
   - child's step-mother
   - child's step-father
   - child's grandmother
   - child's grandfather
   - other adult female
   - other adult male

7) How many people live in your home?_____

8) Of those, how many are under the age of 18?_____

9) What is the highest level of education of the child's mother or female guardian?
- eighth grade or less
- some high school, but no diploma
- high school diploma or equivalent
- high school diploma or equivalent, plus technical training/certificate
- some college but no degree
- A.A./A.S./two-year degree
- bachelor's degree
- at least one year of course work beyond a B.A. or B.S.
- Master's degree
- Education specialist or professional diploma beyond Master's
- Doctoral degree
- other, please specify_____

10) What is the annual total family income from all sources?
- $5,000 or less
- $5,001-$10,000
- $10,001-$15,000
- $15,001-$20,000
- $20,001-$25,000
- $25,001-$30,000
- $30,001-$35,000
- $35,001-$40,000
- $40,001-$45,000
- $45,001-$50,000
- $50,001-$55,000
- $55,001-$60,000
- $60,001-$65,000
- $65,001-$70,000
- $70,001-$75,000
- $75,001- $80,000
- $80,001-$85,000
- $85,001 or more

11) Circle the term that best describes your preschooler's race/ethnicity:
- Black/African-American
- Native American/American Indian
- White/Caucasian
- Mexican American/Chicano
- Puerto Rican
- Cuban
- Other Hispanic/Latino
- Filipino
- Other Pacific Islander
- Japanese
- Chinese
- Korean
- Asian Indian
- Other Asian
- other, please specify_____